1) ~~$(-\infty,-1]$~~ $\cup [1,\infty)$ $f(x)=\sqrt{x^2-1}$ Domain: $x^2-1\geq 0$

$g(x)=\sqrt{x-1}$ $[1,\infty)$ Domain: $x-1\geq 0$, $x\geq 1$

$\left(\frac{f}{g}\right)(x)=\frac{\sqrt{x^2-1}}{\sqrt{x-1}}=\frac{\sqrt{(x-1)(x+1)}}{\sqrt{x-1}}$ $x\neq 1$

$=\frac{\sqrt{x-1}\sqrt{x+1}}{\sqrt{x-1}}$

$=\sqrt{x+1}$

Domain $(1,\infty)$

$x^2-1\geq 0$

$(x-1)(x+1)\geq 0$

+ + + | − − − | + + +

−10 −1 0 1 10

2) $f(x) = 1 + x$; $g(x) = x^2 - x$

Find

$(f \circ g)(3) - 2f(1)$

$f(g(3)) - 2f(1)$

$= f(6) - 2(2)$

$= 7 - 4 = 3$

3) $f(x) = 9x+2$; $g(x) = \frac{x-2}{9}$

Show $(f \circ g)(x) = x$

$$(f \circ g)(x) = 9\left(\overset{g(x)}{\frac{x-2}{9}}\right)+2$$

$$= \frac{9}{1}\left(\frac{x-2}{9}\right)+2$$

$$= \frac{9(x-2)}{9 \cdot 1}+2$$

$$= \left(\frac{9}{9}\right)\left(\frac{x-2}{1}\right)+2$$

$$= x-2+2 = x$$

THIS is BAD

DON'T WRITE THIS.

$$9\left(\frac{x-2}{9}\right) = \frac{9x-18}{81}$$

$$\neq \frac{9x-18}{9}+2$$

4) $g(t) = \dfrac{3}{\sqrt{t-3}} + 7$

$$a(t) = \frac{3}{t} + 7$$

$$b(t) = \sqrt{t-3}$$

$$\left.\begin{array}{l} g(t) = \\ \dfrac{3}{\sqrt{t-3}} + 7 = \end{array}\right\} (a \circ b)(t)$$

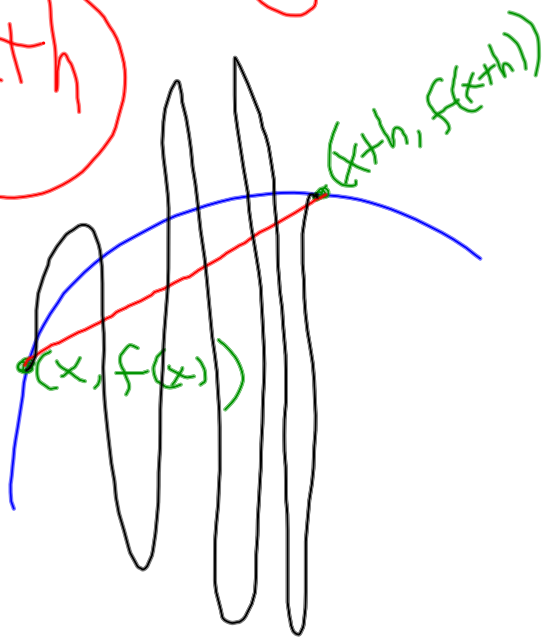
$$f(x) = x^2$$

find $\dfrac{f(x+h)-f(x)}{h}$ Difference Quotient

$$\frac{(x+h)^2 - x^2}{h} = \frac{(x^2+2hx+h^2)-x^2}{h}$$

$$= \frac{2hx+h^2}{h} = \frac{h(2x+h)}{h \cdot 1}$$

$$= 2x+h$$



$$\frac{f(x+h)-f(x)}{h}$$

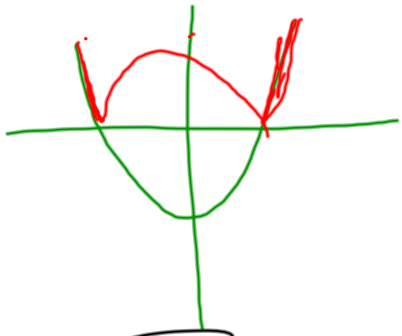
$$m = \frac{f(x)-f(x+h)}{x-(x+h)}$$

$$= \frac{[f(x)-f(x+h)](-1)}{[-h](-1)} = \frac{f(x+h)-f(x)}{h}$$

3-5/43 $g(x) = |x|$

$f(x) = 0.5x^2 - 5$

$(g \circ f)(x) = |0.5x^2 - 5|$



47)

3.5/47? Use piecewise definition of $|x|$ to show

$$(g\circ f)(x) = \begin{cases} -f(x) \text{ if } f(x)<0 \\ f(x) \text{ if } f(x)\geq 0 \end{cases}$$

$g(x) = |x|$

sign

x

$f(x)$

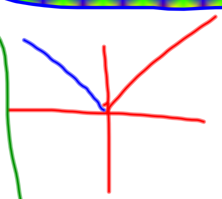
$|f|$

$(g\circ f)(x)$

$$|x| = \begin{cases} -x, & x<0 \\ x, & x\geq 0 \end{cases}$$

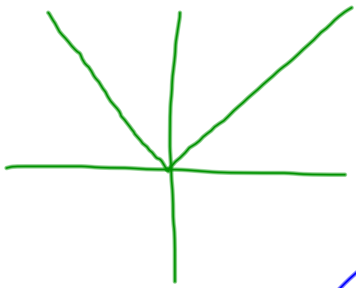
$y = x3$

$$y = \begin{cases} x^3, & x<0 \\ x^3, & x\geq 0 \end{cases}$$

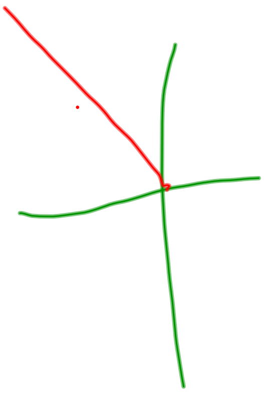


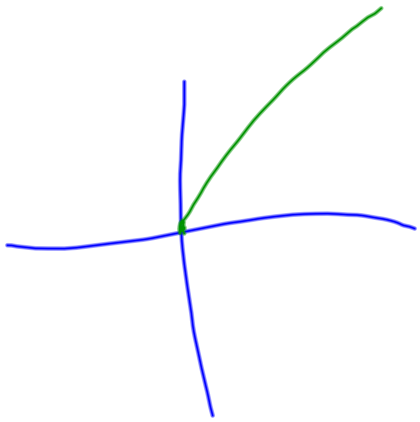
3.6/37

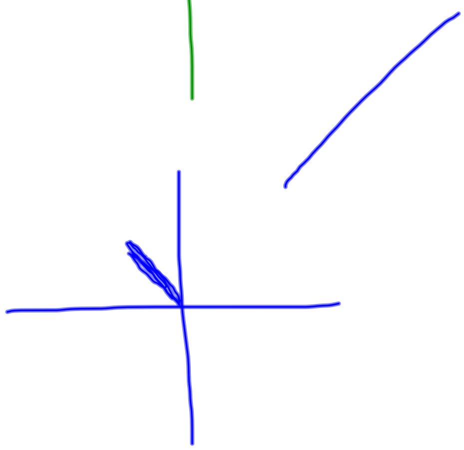
$f(x) = |x|$

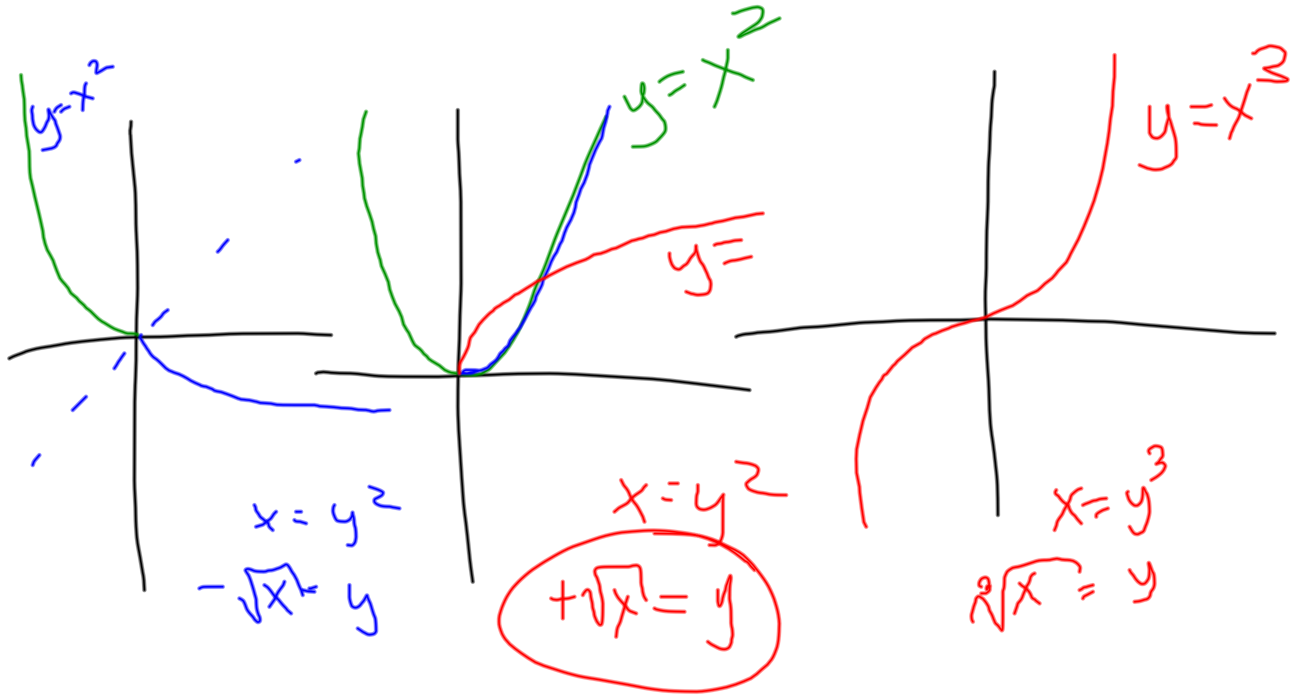


ONE-TOONE









y=x²
x = y²
-√x = y
y = x²
y =
x = y²
+√x = y
y = x³
x = y³
∛x = y